

REMARKS

The rejection of Claims 1-20 under 35 U.S.C. § 103(a) as unpatentable over U.S. 5,026,936 (Leyshon et al) in view of U.S. 3,832,449 (Rosinski et al), is respectfully traversed.

The present invention relates to a process for the production of propylene under cracking conditions by contacting a predominately olefinic hydrocarbon stream in the presence of a catalyst composition comprising a particular type of zeolite.

As described in the specification beginning at page 1, line 21, catalytic cracking processes for producing propylene are known, including such processes using zeolite catalysts. Even with these prior art zeolite catalysts, however, experts in the field still require greater conversions and at the same time, increased stability of catalytic activity over a period of time.

The presently-claimed process uses materials capable of improving the yield to propylene and that also have a great advantage of maintaining the catalytic performance practically constant over a period of time. Thus, as recited in above-amended Claim 1, the invention is a process for the production of propylene comprising contacting a mixture of hydrocarbons with a catalyst composition under cracking conditions, thereby producing a product comprising propylene from said mixture, wherein the mixture of hydrocarbons comprises predominately olefins, the mixture has a boiling point ranging from -15°C to +80°C, the catalyst composition comprises a large pore zeolite comprising a lattice of 12 tetrahedrons, and the zeolite has a molar ratio of silica/alumina from 100 to 200.

ZSM-12 zeolite is a species of a large-pore zeolite, i.e., a zeolite having a lattice consisting of 12 tetrahedrons, as described in the specification in the paragraph bridging pages 6 and 7. As Applicants describe in the specification beginning at page 7, line 15, contrary to what is specified in scientific and patent literature, the ZSM-12 material has the best catalytic performance at SiO₂/Al₂O₃ ratios < 200 (mol/mol).

The specification contains comparative data demonstrating both the significance of the molar ratio of silica/alumina, when using a ZSM-12 catalyst, and a ZSM-12 catalyst compared to a ZSM-5 catalyst, as now discussed. Example 3 demonstrates catalytic testing of a ZSM-12 zeolite having a molar ratio $\text{SiO}_2/\text{Al}_2\text{O}_3$ of 100. Comparative Example 4 is otherwise similar but employs a molar ratio $\text{SiO}_2/\text{Al}_2\text{O}_3$ of 250. The results for total conversion and selectivity to propylene are shown for Example 3 and Comparative Example 4 in Figures 1 and 2, respectively. The differences in results are manifest. For Example 3, and as described in the specification at page 12, lines 15-19, the total conversion and selectivity to propylene are high and remain steady for a time on stream (tos) of at least 140 hours, thus demonstrating unexpected stability and no catalytic deterioration phenomena during this time. For Comparative Example 4, on the other hand, and as described in the specification at page 15, lines 5-12, contrary to what is specified in the literature, the catalytic performance of ZSM-12 with a molar ratio $\text{SiO}_2/\text{Al}_2\text{O}_3$ of 250 is lower both in terms of yield and duration, with respect to the zeolite having a greater content of Al_2O_3 , and already after 25 hours of tos, evident catalytic deterioration phenomena are present.

Comparative Example 5 exemplifies a commercial ZSM-5 zeolite having a molar ratio $\text{SiO}_2/\text{Al}_2\text{O}_3$ of 30. As shown in Figure 3, and as described in the specification at page 17, lines 13-15, the catalytic performances of ZSM-5 are much lower both in terms of yield (product of selectivity and conversion) and duration, with respect to the ZSM-12 zeolite. Indeed, as indicated by Figure 3, and as described in the specification at page 17, lines 16-18, already after 10 hours of tos, catalytic deterioration phenomena are present.

The above-discussed results could not have been predicted by the applied prior art.

Leyshon et al discloses a process for preparing propylene by cracking a mixture of C_{4+} hydrocarbons in the presence of apparently any zeolite catalyst, under conditions that favor production of a product mixture containing ethylene and propylene, separating and

recovering propylene from this product mixture, and then subjecting the ethylene to a metathesis reaction to form further quantities of propylene (column 1, lines 8-17). Leyshon et al lists a relatively large group of zeolite catalysts, including ZSM-11, ZSM-21, ZSM-38, ZSM-23, ZSM-35, phosphorus-containing zeolites, zeolite A, zeolite X, zeolite Y, zeolite ZK-5, zeolite ZK-4, and others (column 3, line 65 through column 4, line 30). While Leyshon et al also lists ZSM-12, citing Rosinski et al (column 4, lines 13-14), Leyshon et al prefer acid zeolites, and most particularly a ZSM-5 zeolite (column 4, lines 17-19). Indeed, a ZSM-5 catalyst is the only catalyst exemplified in an example of Leyshon et al.

Rosinski et al, as discussed above, discloses a particular ZSM-12 zeolite, for use in cracking and other catalytic processes, although cracking of a predominately olefin-containing hydrocarbon mixture to form propylene is not specifically disclosed therein. It is only with the present disclosure as a guide that one skilled in the art would choose the ZSM-12 catalyst of Rosinski et al, and one having a molar ratio $\text{SiO}_2/\text{Al}_2\text{O}_3$ within the presently-recited range, in the process of Leyshon et al, given the fact that Leyshon et al is not limited with regard to the particular zeolite catalyst used, and considering the fact that Leyshon et al actually prefers a ZSM-5 catalyst, shown above as being inferior to a ZSM-12 catalyst. Indeed, Leyshon et al is so broad, as not even being sufficient to present a *prima facie* case of obviousness.

The fact that a claimed species or subgenus is encompassed by a prior art genus is not sufficient by itself to establish a *prima facie* case of obviousness. *In re Baird*, 16 F.3d 380, 382, 29 USPQ2d 1550, 1552 (Fed. Cir. 1994) (**copy enclosed**) ("The fact that a claimed compound may be encompassed by a disclosed generic formula does not by itself render that compound obvious.") See also MPEP 2144.08.

In addition, since Leyshon et al requires a subsequent metathesis reaction, it suggests to persons skilled in the art that satisfactory yields of propylene require the addition of such a metathesis reaction.

Thus, in contradistinction to Leyshon et al's disclosure that the zeolites are generally interchangeable but that ZSM-5 is preferred, Applicants have shown that not all zeolites are interchangeable and that ZSM-5 is inferior to ZSM-12, and that the molar ratio of silica/alumina of the ZSM-12 used is significant.

Claims 17-19 are separately patentable, since the applied prior art neither discloses nor suggests maintenance of catalytic activity for the prescribed time recited in these claims.

For all the above reasons, it is respectfully requested that the rejection over Leyshon et al in view of Rosinski et al be withdrawn.

The rejection of Claims 1-20 under 35 U.S.C. § 112, first paragraph, as failing to satisfy the enablement requirement thereof, is respectfully traversed. Indeed, the rejection is now moot in view of the above-discussed amendment. Accordingly, it is respectfully requested that it be withdrawn.

The rejection of Claims 15-20 under 35 U.S.C. § 112, first paragraph, as failing to satisfy the written description requirement thereof, is respectfully traversed. Claims 15 and 16 have been canceled. With regard to Claims 17-19, Applicants describe in the specification at page 12, lines 15-19, with regard to Figure 1 that no catalytic deterioration phenomena are present until at least 140 hours of tos, and at page 15, lines 10-12, with regard to Figure 2 that already after 25 hours of tos, evident catalytic deterioration phenomena are present. These disclosures together support the limitation "for 25 hours or more." With regard to Claim 20, while the relied on disclosure is for preparation of ZSM-12, ZSM-12 is a species of a large-pore zeolite, i.e., a zeolite having a lattice consisting of 12 tetrahedrons, which would be prepared in a similar manner.

For all the above reasons, it is respectfully requested that this rejection be withdrawn.

The rejection of Claims 1-20 under 35 U.S.C. § 112, second paragraph, is respectfully traversed. The claims now recite the step of conversion to propylene. With regard to the term "25 hours or more", the term "or more" is intended to cover an unlimited period, or at least as long as the composition maintains catalytic activity.

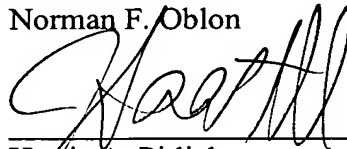
For all the above reasons, it is respectfully requested that this rejection be withdrawn.

Applicants **again** respectfully request that the Examiner send return acknowledgment of the Information Disclosure Statement (IDS) filed on January 3, 2002, by returning a signed and initialed copy of the PTO-1449 Form (sheet 1 of 1) submitted with this IDS. The copy of the Form attached to the Office Action dated March 16, 2004 was not initialed. **Submitted herewith** is a copy of the Form.

All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this case to issue.

Respectfully submitted,

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In re Baird (CA FC) 29 USPQ2d 1550

In re Baird

U.S. Court of Appeals Federal Circuit
29 USPQ2d 1550

Decided January 19, 1994
No. 93-1262

Headnotes

PATENTS

1. Patentability/Validity -- Obviousness -- Relevant prior art -- Particular inventions (§ 115.0903.03)

Application claim for flash fusible toner is not obvious in view of prior patent, even though generic diphenol formula of patent encompasses bisphenol A of claim, since disclosure of generic formula that may encompass claimed compound does not, without more, render compound obvious, and since generic diphenol formula of patent contains large number of variables and encompasses estimated 100 million different diphenols in addition to bisphenol, but patent does not suggest selection of specific variables to formulate that compound and specifically discloses diphenols which are different from, and more complex than, bisphenol A; prior patent's specific enumeration of derivatives of bisphenol A does not warrant contrary conclusion, since suggestion of certain complex bisphenol A derivatives does not describe or suggest bisphenol A itself and thus does not motivate its selection.

Case History and Disposition:

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Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Patent application of Brian W. Baird, Art F. Diaz, William H. Dickstein and Charles M. Seymour, serial no. 07/333,524 (flash fusible toner resins). From decision upholding examiner's final rejection of claims 1-5 on ground of obviousness under 35 USC 103, applicants appeal. Reversed.

Attorneys:

John A. Brady, Lexington, Ky., for appellant.

Adriene B. Lepiane, assistant solicitor, PTO (Fred E. McKelvey, solicitor, and Richard E. Schafer, associate solicitor, with her on brief), for appellee.

Judge:

Before Michel, Plager, and Lourie, circuit judges.

Opinion Text

Opinion By:

Lourie, J.

Applicants Brian W. Baird, Art F. Diaz, William H. Dickstein, and Charles M. Seymour (collectively Baird) 1 appeal from the October 15, 1992 decision of the U.S. Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences, Appeal No. 92-0860, affirming the examiner's final rejection of claims 1-5 of application Serial No. 07/333,524, entitled "Flash Fusible Toner Resins," as unpatentable on the ground of obviousness under 35 U.S.C. Section 103 (1988). We reverse.

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BACKGROUND

Baird's application is directed to a flash fusible toner comprising a polyester of bisphenol A and an aliphatic dicarboxylic acid. Synthesis of the toner compositions involves the acetylation of bisphenol A and the reaction of that product with an aliphatic dicarboxylic acid selected from the group consisting of succinic acid, glutaric acid, and adipic acid. The application discloses that toners containing bisphenol A have optimal characteristics for flash fusing including, *inter alia*, high thermal stability and low critical surface energy.

Claim 1, the only claim at issue, reads as follows:

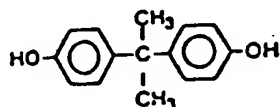
1. A flash fusible toner comprising a binder resin which is a bisphenol A polyester containing an aliphatic di [carboxylic] acid selected from the group consisting of succinic acid, glutaric acid and adipic acid.

Claim 1 stands rejected as obvious over U.S. Patent 4,634,649 to Knapp et al., which relates to developer compositions comprised of, *inter alia*, the polymeric esterification product of a dicarboxylic acid and a diphenol of the following generic formula:



wherein R is selected from substituted and unsubstituted alkylene radicals having from about 2 to about 12 carbon atoms, alkylidene radicals having from 1 to 12 carbon atoms and cycloalkylidene radicals having from 3 to 12 carbon atoms; R' and R'' are selected from substituted and unsubstituted alkylene radicals having from 2 to 12 carbon atoms, alkylene arylene radicals having from 8 to 12 carbon atoms and arylene radicals; X and X' are selected from hydrogen or an alkyl radical having from 1 to 4 carbon atoms; and each n is a number from 0 (zero) to 4.

Col. 4, lines 16-38. The Knapp formula contains a broad range of variables and thus encompasses a large number of different diphenols, one of which is bisphenol A, which is shown in Baird's application as having the following structure:



Knapp also discloses that the dicarboxylic acids have the general formula:

$\text{HOOCR}''\text{'n}_3\text{COOH}$ wherein R'' is a substituted or unsubstituted alkylene radical having from 1 to 12 carbon atoms, arylene radicals or alkylene arylene radicals having from 10 to 12 carbon atoms and n₃ is a number of less than 2.

Col. 5, lines 6-14. Twenty typical dicarboxylic acids are recited, including succinic acid, glutaric acid, and adipic acid, the dicarboxylic acids recited in claim 1.

The examiner rejected claim 1 as obvious on the ground that Knapp specifically discloses as components of his esters the three dicarboxylic acids recited in claim 1 and a generic formula which encompasses bisphenol A. Recognizing that bisphenol A is defined when certain specific variables are chosen, the examiner reasoned that bisphenol A "may be easily derived from the generic formula of the diphenol in [Knapp] and all the motivation the worker of ordinary skill in the art needs to arrive at the particular polyester of the instant claim[] is to follow [that formula]."

The Board upheld the examiner's rejection. It rejected Baird's argument that there was no motivation for one to select bisphenol A from Knapp and summarily concluded that "the fact that [the claimed] binder resin is clearly encompassed by the generic disclosure of Knapp . . . provides ample motivation for the selection of [the claimed composition]." Slip op. at 3. The Board's decision was affirmed on reconsideration.

DISCUSSION

The only issue before us is whether the record supports the Board's conclusion that, in view of the teachings of Knapp, the claimed compounds 2 would have been obvious to one of ordinary skill in the art. We review an obviousness determination by the Board *de novo*, while we review underlying factual findings for clear error. *In re Beattie*, 974 F.2d 1309, 1311, 24 USPQ2d 1040, 1041 (Fed. Cir. 1992).

Baird does not dispute the fact that the generic diphenol formula of Knapp encompasses bisphenol A. Nor does Baird dispute that Knapp specifically discloses the three dicarboxylic acids recited in claim 1. Rather, Baird argues that there is no suggestion in Knapp to select bisphenol A from the vast

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number of diphenols covered by the generic formula and that the Board thus erred in concluding that the claimed compounds would have been obvious.

[1] What a reference teaches is a question of fact. *Beattie*, 974 F.2d at 1311, 24 USPQ2d at 1041. The fact that a claimed compound may be encompassed by a disclosed generic formula does not by itself render that compound obvious. *In re Jones*, 958 F.2d 347, 350, 21 USPQ2d 1941, 1943 (Fed. Cir. 1992) (rejecting Commissioner's argument that "regardless [] how broad, a disclosure of a chemical genus renders obvious any species that happens to fall within it"). *Jones* involved an obviousness rejection of a claim to a specific compound, the 2-(2'-aminoethoxy)ethanol salt of 2-methoxy-3,6-dichlorobenzoic acid (dicamba), as obvious in view of, *inter alia*, a prior art reference disclosing a genus which admittedly encompassed the claimed salt. We reversed the Board's rejection, reasoning that the prior art reference encompassed a "potentially infinite genus" of salts of dicamba and listed several such salts, but

that it did not disclose or suggest the claimed salt. *Id.*

In the instant case, the generic diphenol formula disclosed in Knapp contains a large number of variables, and we estimate that it encompasses more than 100 million different diphenols, only one of which is bisphenol A. While the Knapp formula unquestionably encompasses bisphenol A when specific variables are chosen, there is nothing in the disclosure of Knapp suggesting that one should select such variables. Indeed, Knapp appears to teach away from the selection of bisphenol A by focusing on more complex diphenols, including 2,2-bis(4-beta-hydroxyethoxyphenyl) propane, 2,2-bis(4-hydroxypropoxyphenyl) propane, and 2,2-bis(4-hydroxyisopropoxyphenyl)propane. Col. 4, lines 51-64. Knapp teaches that in preferred diphenols, R has 2 to 4 carbon atoms and R' and R'' have 3 to 4 carbon atoms, and in "optimum" diphenols, R is an isopropylidene radical, R' and R'' are selected from the group consisting of propylene and butylene radicals, and n is one. Col. 4, lines 38-47. Knapp further states that the diphenol in the preferred polyester material is 2,2-bis(4-hydroxyisopropoxyphenyl)propane. Col. 5, lines 36-38. Fifteen typical diphenols are recited. None of them, or any of the other preferred phenols recited above, is or suggests bisphenol A.

The Commissioner repeatedly emphasizes that many of the diphenols specifically enumerated in Knapp are derivatives of bisphenol A. He argues that Knapp thus suggests the selection of bisphenol A itself. We disagree, because, according to the specification, the diphenol in the esters of claim 1 can only be bisphenol A, not a bisphenol A derivative. While Knapp may suggest certain complex bisphenol A derivatives, it does not describe or suggest bisphenol A and therefore does not motivate the selection of bisphenol A.

"[A] reference must be considered not only for what it expressly teaches, but also for what it fairly suggests." *In re Burckel*, 592 F.2d 1175, 1179, 201 USPQ 67, 70 (CCPA 1979). Given the vast number of diphenols encompassed by the generic diphenol formula in Knapp, and the fact that the diphenols that Knapp specifically discloses to be "typical," "preferred," and "optimum" are different from and more complex than bisphenol A, we conclude that Knapp does not teach or fairly suggest the selection of bisphenol A. *See In re Belle* 991 F.2d 781, 26 USPQ2d 1529 (Fed. Cir. 1993) (DNA sequence would not have been obvious in view of prior art reference suggesting a nearly infinite number of possibilities and failing to suggest why among all those possibilities one would seek the claimed sequence). A disclosure of millions of compounds does not render obvious a claim to three compounds, particularly when that disclosure indicates a preference leading away from the claimed compounds.

CONCLUSION

The Board clearly erred in finding that Knapp would have provided the requisite motivation for the selection of bisphenol A in the preparation of the claimed compounds. Accordingly, the decision of the Board affirming the rejection of claim 1 as obvious over Knapp is reversed.

COSTS

No costs. *REVERSED*

Footnotes

Footnote 1. The real party in interest is Lexmark International, Inc.

Footnote 2. Since the toner, the resin, and the polyester compounds appear to be treated in the Board opinion and patent application as synonymous, and the PTO has premised its obviousness rejection on the obviousness of the compounds, we will treat this case accordingly.

- End of Case -